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THE SPRUCE APHIS
(Aphis abietina Walker)

Family Aphididae - Order Homoptera

Economic Importance

The Spruce Aphid (Aphis abietina Walker) sometimes causes serious damage to Sitka spruce (Picea sitchensis) along the coast of Oregon, Washington and British Columbia. In this region Sitka spruce is one of the most valuable forest trees. It is normally tall and straight and the wood is highly prized for special uses such as airplane wood, veneer etc.

The Spruce Aphid is a widespread species. It has been present for many years in south England but has been recorded as doing actual harm in the British Isles only in 1846 and 1913.

The aphids feed on the spruce needles which subsequently turn brown and fall to the ground. As a rule they do not occur in destructive numbers more than two or three years in succession. Young trees appear to be more able to withstand aphid attack than are the older or more mature trees.

Aphid injury very seriously affects the appearance and health of trees, however, no information is available on the ability of infested trees to recover or on the number of defoliations necessary to produce death. Conflicting reports from "Injury serious but not actually fatal" to "more serious than any other insect attacking spruce" can be found.

In one area in Oregon and Washington it was estimated that 40,000 acres of tideland spruce was seriously affected during an outbreak of this insect in 1918.

In Vancouver, B. C. in 1916 this insect caused serious damage to trees in Beacon Hill Park, where several large trees were reported as beyond recovery. In 1918 it was reported as killing and defoliating trees used for park, landscape and windbreak purposes along the coast of Oregon and Washington.

The aphid causes unsightliness in trees which it attacks and reduces their aesthetic value.

History:

The Spruce Aphid is also commonly known as the Green Spruce Aphis and the Sitka Spruce Aphis, as well as by a number of other names.

This insect has been known in England since 1846. It was first recorded from the Pacific Coast in 1914-1916, the first and only authentic record from North America. Discovered in 1914 in Stanley Park, B. C. and later in Columbia River Region in 1917 and 1918. In 1917 an outbreak extended from Tillamook City to Neahkahnie. In 1919 it was reported from Marshfield, Oregon.

The Spruce Aphid is of widespread distribution. Outbreaks occurred in Kent, England in 1911, in 1889 at Kingston-on-Thames, and in 1891 near Odde in Norway.

Description of the Insect:

The Spruce Aphid, like all aphids, passes through stages of development differing somewhat from the stages of most insects. With some aphids, in regions having mild winters, the egg stage is entirely omitted. Eggs of the spruce aphid have not as yet been found or described. The adult viviparous females,both of the apteramo and alate forms, give birth to living young (nymphs) which in appearance very much resemble the adult insects. These nymphs are sometimes referred to as larvae in English literature, the pupae stage being that when the wings are half grown. This designation of stages is not in use elsewhere. The sexuparae have not been found.

Description of the Adult:

The adult forms of this insect are small, green, soft-bodied insects and occur either as winged or wingless forms. The body is pear-shaped. The head is small, with two compound eyes. The eyes are bright red.

Winged viviparans female:

Smaller than the nymph. Fine green, Head Olive and somewhat broad. Neck and thorax robust. Thoracic lobes and scutellum dark olive. Abdomen green, with a slight yellow carina. Cormicles long and, like the legs and tail pale green. Tips of the tibiae and the tarsi dark olive. Stemmata on the occiput obvious as also are two depressions behind the eyes. Rostrum reaches to the third

coxae. Eyes bright red. Wings with rounded apices. Cubitus and stigma yellowish green. Venis brown. These are liable to abnormal variation.

Apterans viviparans female: Bright green, slightly mealy, Shagreened. Head luteous, Abdomen long, oval, with a pointed apex. Cornicles long and cylindrical. Two spots on the head, and a row of dark green spots on the convexivum. Tail about two-thirds of the length of the cornicle. Eyes red. Rastrum reaches to the third coxae.

Description of Work: The Spruce Aphid is responsible for brown appearance and falling of needles and the consequent unhealthy conditions of the trees which attract much attention. They suck the juice from older spruce needles causing many to fall. Sitka spruce needles which have been fed upon soon fall completely off. Needles of Picea excelsia turn brown but remain on the tree. Damage differs with different species and severity of feeding. With some the needles all fall, in some cases none and in some cases a few fall. The dead spruce needles are spotted, brown, brittle and falling. Cambrium black all around bales cleat to ground. Trees entirely dead in many cases. A yellow spot appears where apterous mother feeds; it sometimes has a reddish tinge and later darkens; two or three of these spots in old trees seem sufficient to kill the needle, whilst in young ones they remain, and the needles seldom die. Infested trees have a reddish or scorched appearance.

Food Plants:

The list of food plants on which the Spruce Aphid feeds contains most of the spruces. In this country Sitka spruce (Picea sitchensis) is particularly affected. In England (Picea excelsa) is listed as the favored host plant. Other spruces which are attacked by this insect are: Picea pungens, Picea engelmanni, Picea nigri, Picea alba, Picea gigantea, Picea rubra, Picea morunda, Picea orientalis, Picea monstrosa, Picea omorica, Picea Kosteriana, Picea glehire, Scots fir, Weymouth pine.

Immune varieties are: Picea polita, Picea hondaensis, Picea alcoquiana, Picea alaskiana, No benus but Picea.

There is believed to be an alternate host to which the spruce aphid migrated in early summer but as yet this host plant has remained undiscovered.

Distribution:

The spruce aphid is a holartic species and has been reported as occurring in the British Isles; from various localities in England, Wales and Ireland but not from Scotland. It has also been recorded from Odde, Norway and from Holland, and from British Columbia and Washington and Oregon.

It ranges in North America from British Columbia to California, occurring chiefly in the tideland areas along the coast in British Columbia, Washington and Oregon. The Spruce Aphid occurred

in serious numbers in Stanley Park, Vancouver, British Columbia in 1914-1916. Since its first appearance in Vancouver it has been reported in injurious numbers at many points along the west coast. It has been found in numbers in the following locations: North Bend, Oregon; Southern Oregon coast; Marshfield, Oregon; Knappa, Oregon; Lower Columbia River Basin in Wahkiakum County; a mile from Columbia river between Cathlamet and Brookfield. Along the coast and foothills from Tillamook City, Bay City, Geribaldi and Nehalem to Neahkahnie; Todd's or Dean's Point between Nehalem and Wheeler.

Life History and Habits:

During the winter months the apterous females of the Spruce Aphid can be found amongst the needles of the spruce trees. These females give rise to the summer's brood. They begin reproduction in early March. In one case the first winged forms left the spruce by April 9 and continued to migrate until near the end of May. Apterous aphids usually occur along the needles, a single one settling on each needle and giving rise to a colony of young, which later spread out and do the same. The females reproduce porthogenitically and give rise to several generations during the summer months. The winged forms migrate early in summer to an alternate host which as yet remains unknown.

In one case the insects migrated from spruce by the end of

the first week in June. In December winged migrants returned to spruce in large numbers and caused much foliage injury by end of that month.

The insect is very sluggish both when in the apterous and alote stages, but if branch is cut off they become active and in a few hours wander from the needle.

Severe outbreaks appear occasionally and last for two or three years. There is usually a lapse of time between severe attacks.

The sexuparae have not as yet been found and it is not yet known whether this form passes through an egg stage or not. The apterae occur from January to December.

Where the mother aphid feeds a yellow spot occurs on the needle, sometimes with a reddish tinge which later darkens. Two or three spots on old trees appear sufficient to kill needle. The aphids wander about the shoats, remaining and feeding there. They do not attack the new growth in summer but in autumn and winter they also attack the new growth. The insects are abundant in the spring but scarce in the late summer and fall.

Seasonal History:

The aphids pass the winter on the spruce needles as apterous females. They live on the needles in spring and early summer but leave during the summer for (unknown) alternate host.

Ecological Relationships:

The spruce aphid occurs in the tideland swamps of Sitka

spruce. Its damage is most noticeable near tidewater and on small and second growth trees. It also occurs on large or virgin growth on upland sites near the coast. A distance of three miles inland no trace was found. In some cases large spruce has been reported dead in the hills, but not far into upland spruces.

It has been serious in tideland areas along the coast of Washington and Oregon.

The spruce aphid attacks spruces of all sizes and ages from nursery stock to eighty years and over.

Damp mild winters place the spruce in unhealthy conditions and enable aphids to flourish.

Individual varieties of the same species of tree differ in susceptibility to attack. Species next to one another at times found unattacked when one species in nursery would be infested. Some big trees escape and others do not escape infestation. Evidently the condition of the host has much to do with attack. Isolated trees,on road sides, margins of woods etc, from 300 to 400 foot altitude show severest attack. The spruce aphid evidently has an alternate host, but this has not been found.

Prevention and Control Methods:

Direct Control (Chemical Methods)

No practical remedies for the control of this pest on forest trees has as yet been devised. On shade and ornamental

trees it can be controlled by spraying with insecticides, such as kerosene emulsion, nicotine solutions etc. if applied late in the fall or early spring. Paraffin jelly, nicotine and soft soap, quassic and soft soap, soft soap alone, lime sulphur wash, White's Ahol, McDougall's Summer Wash, and Cook's Tobacco Wash. Cook's Tobacco Wash is the best; nicotine and soap, next; White's Abol, next. McDougall's Summer Wash and paraffin jelly, next; then soft soap and quassia. Soft soap alone is not so good as the other sprays. Lime sulphur is no good as a spray against aphids.

A fine spray, with force which wets well the foliage, gives best results. The winter treatment with strong paraffin jelly is very good. Ornamentals should be sprayed with 40% nicotine sulphage. Spray in the spring with nicotine sulphate when the aphids are first seen. These aphids are readily controlled by sparying with contact sprays.

Indirect Control (Biological)

The spruce aphid is a defenseless insect with many natural enemies. However, there are no parasitic or predacious insect enemies in winter, nor until after June and July.

Syrphus larvae, spiders and coccinellid larvae destroy aphids. Several spiders, 2 species of Phalangidae or harfest men, and adults of Scymoms sp and its larvae are also natural enemies of the aphid. Other insect enemies are two chalcids and several Syrphid larvae. Long eared bats have been observed feeding on alate females, aptera and nymphae.

Bibliography

Batterson, S. M.	(1918)	Letters to McLeod, Hammard Lbr.Co. Aug. 11
Chrystal, R. N.	(1916)	Proc. B. C. Ent. Soc. #9
Chrystal, R. N.	(1916)	Rept. Dom. Ent. for 1916
Essig, E. O.	(1926)	Insects of Western North America
Gillander, A. J.	(1912)	Forest Entomology
Hewitt, C. J.	(1915)	Rept. Dom. Ent. Canada
Hopkins, A. D.	(1918)	U.S.D.A. Bur. Ent. For. Ent. Brief 43
Hopkins, A. D.	(1918)	Letter to Miller, Dec. 4
Hopkins, A. D.	(1919)	Letter to Simpson, May 24
Jaenicke, A. J.	(1918)	Damage to Sitka Spruce etc.
Kotinsky, J.	(1918)	"Compilation"
Miller, J. M.	(1919)	Letter to Perkins, March 24
Miller, J. M.	(1919)	Letter to District Forester, April 28
Miller, J. M.	(1919)	Letter to Hopkins, May 6
Miller, J. M.	(1919)	Annual Report, June 30
Perkins, E. J.	(1919)	Letter to Hopkins, June 17
Theobald, F. V.	(1914)	Annals of Applied Biology, V. I#1
Whitford & Craig	(1918)	Forests of British Columbia
Wilson, H. J.	(1915)	Proc. B. C. Ent. Soc. #5 m.s.
Bucton, G. B.	(1877)	A Monograph of British Aphids V2 p. 43 ill